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TRANSMITTAL LETTER (General - Patent Pending)	Docket No. US010566 (18596)

In Re Application Of: **Srinivas Gutta, et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/014,199	November 13, 2001	Donald L. Champagne	23389	3622	2990

Title: **CLASSIFIERS USING EIGEN NETWORKS FOR RECOGNITION AND CLASSIFICATION OF OBJECTS**

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Amended Appeal Brief

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Dated: **November 23, 2005**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants:	Srinivas Gutta et al.	**Examiner:**	Donald L. Champagne
Serial No.:	10/014,199	**Art Unit:**	3622
Filed:	November 13, 2001	**Docket:**	US010566 (18596)
For:	CLASSIFIERS USING EIGEN NETWORKS FOR RECOGNITION AND CLASSIFICATION OF OBJECTS	**Conf. No.:**	2990
		Dated:	November 23, 2005

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AMENDED APPEAL BRIEF

Sir:

INTRODUCTION

In response to the Notification of Non-Compliant Appeal Brief mailed October 27, 2005 and pursuant to 35 U.S.C. § 134 and 37 C.F.R. § § 1.191 and 1.192, entry of this Amended Appeal Brief in support of the Notice of Appeal filed July 26, 2005 in the above-identified matter is respectfully requested. This paper is submitted as a brief setting forth the authorities and arguments upon which Appellants rely in support of the appeal from the Final Rejection of Claims 1 and 3-12 in the above-identified patent application on April 26, 2005.

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

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Dated: November 23, 2005

Thomas Spinelli

1. STATEMENT OF REAL PARTY OF INTEREST

The real party of interest in the above-identified patent application is Koninklijke Philips Electronics N.V. Corporation.

2. STATEMENT OF RELATED APPEALS AND INTERFERENCES

There are no pending appeals or interferences related to this application to Appellants' knowledge.

3. STATEMENT OF THE STATUS OF THE CLAIMS

A. Claim Status

Claims 1 and 3-12 have been rejected under 35 U.S.C. §103(a) as being obvious over admitted prior art in view of U.S. Patent No. 6,134,537 to Pao et al. ("Pao").

Claim 2 stands canceled.

B. Appealed Claims

Claims 1 and 3-12 are appealed, a clean copy of which are attached hereto in Appendix A.

4. STATEMENT OF STATUS OF AMENDMENTS

The claims were not amended in the Response to the Final Rejection filed June 7, 2005.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The invention with respect to claim 1 comprises a method for classifying inputs to a neural network, comprising performing Principal Component Analysis (PCA) on a plurality of inputs to the neural network to produce a plurality of PCA outputs, coupling each of the plurality of PCA

outputs to a plurality of output nodes, multiplying each coupled PCA output by a weight selected for the coupled PCA output, calculating a node output for each output node, selecting a maximum output from the plurality of node outputs, and associating an output class with the maximum output. (See Fig. 5, page 2, lines 10-18, and page 12 line 19 to page 13, line 2)

The invention with respect to claim 3 comprises a method as claimed in claim 1, wherein each output node corresponds to a class, and wherein the step of associating an output class with the maximum output further comprises determining which output node produces the maximum output and associating the output class with the class corresponding to the output node that produced the maximum output. (See page 5, lines 4-20)

The invention with respect to claim 4 comprises a method as claimed in claim 1, further comprising the step of calculating the weights. (See page 2, lines 20-24 and page 4, lines 14-15)

The invention with respect to claim 5 comprises a method as claimed in claim 4, wherein all inputs comprise a single vector that corresponds to a pattern, and wherein the step of determining the weights further comprises the steps of inputting at least one training vector, computing, for each of the at least one training vectors, PCA outputs, and determining the weights by using the PCA outputs associated with the at least one training vector. (See page 2, 18-29, page 7, lines 25-26, and page 6, lines 6-24)

The invention with respect to claim 6 comprises a method as claimed in claim 5, wherein, each output node corresponds to a class, the step of inputting at least one training vector further comprises associating an input class with each training vector, and the step of determining the weights by using the PCA outputs further comprises determining the weights so that an appropriate output node is selected in the step of selecting a maximum output, the weights being

chosen so that input class matches the class corresponding to the appropriate output node. (See page 5, lines 18-30 and page 11, lines 24-26)

The invention with respect to claim 7 comprises a method as claimed in claim 1, wherein each PCA output comprises an eigenvector. (See page 8, lines 19-20)

The invention with respect to claim 8 comprises a method as claimed in claim 7, wherein each eigenvector has a dimension that is less than the number of inputs. (See page 8, lines 17-20)

The invention with respect to claim 9 comprises a method as claimed in claim 7, wherein each PCA output further comprises an eigenvalue corresponding to the eigenvector of the PCA output. (See page 8, lines 17-20, page 9, and lines 9-10)

The invention with respect to claim 10 comprises a classifier for classifying inputs to a neural network, comprising a Principal Component Analysis (PCA) device coupled to a plurality of inputs to the neural network, the PCA device adapted to perform PCA on the plurality of inputs and to determine a plurality of PCA outputs, a plurality of connections coupled to the PCA outputs and coupled to a plurality of output nodes, each connection having assigned to it a weight, and each output node adapted to produce a node output by using the PCA outputs and the weights, and a device coupled to the node outputs and adapted to determine a maximum node output and to associate the maximum node output with a class. (See Fig. 2, page 7, lines 15-34)

The invention with respect to claim 11 comprises a system for classifying inputs to a neural network, comprising a memory that stores computer readable code, and a processor operatively coupled to said memory, said processor configured to implement said computer readable code to perform Principal Component Analysis (PCA) on a plurality of inputs to the neural network to produce a plurality of PCA outputs, couple each of the plurality of PCA outputs to a plurality of output nodes, multiply each coupled PCA output by a weight selected for the coupled output,

calculate a node output for each output node, select a maximum output from the plurality of node outputs, and associate an output class with the maximum output. (See page 10, lines 11-25)

The invention with respect to claim 12 comprises an article of manufacture for classifying inputs to a neural network, comprising a computer readable medium having computer readable code embodied thereon, said computer readable program code being executable to perform a method comprising performing Principal Component Analysis (PCA) on a plurality of inputs to a neural network to produce a plurality of PCA outputs, coupling each of the plurality of PCA outputs to a plurality of output nodes, multiplying each coupled PCA output by a weight selected for the coupled output, calculating a node output for each output node, selecting a maximum output from the plurality of node outputs, and associating an output class with the maximum output. (See page 10, lines 11-25)

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPLEAL

The issue presented for review is whether claims 1 and 3-12 are patentable over admitted prior art in view of U.S. Patent No. 6,134,537 to Pao et al. ("Pao").

7. ARGUMENTS

A. The Rejection of claims 1 and 2-13, on appeal under 35 U.S.C. § 103, as being unpatentable over admitted prior art in view of Pao et al. is improper.

1. CLAIMS 1, 10, 11, and 12

In an Official Action dated November 30, 2004, the Examiner rejected Claims 1-12 under 35 U.S.C. §103(a) as being obvious over admitted prior art in view of U.S. Patent No. 6,134,537 to Pao et al. ("Pao").

In an Amendment and Response, filed February 10, 2005, Claims 1, 3-4, and 10-12 were amended to point out more clearly the claimed invention and to highlight the differences between the claimed invention and the cited prior art. Further, Claim 2 was canceled. However, in the Final Official Action, issued March 26, 2005, the Examiner rejected all the pending claims based on the same prior art.

Appellant respectfully disagrees with the Examiner's characterization and interpretation of the references cited and discussed in the Final Office Action. Because the references do not, in fact, describe what is alleged in the Final Office Action, Appellant submits that the suggestion and motivation to combine these references is improper and that the section 103(a) rejections are defective.

With respect to independent claims 1, 10, 11, and 12, the Examiner states that the admitted prior art detailed in Appellants' application teaches the Appellants' claimed invention excluding using Principal Component Analysis (PCA). Further, the Examiner states that Pao teaches PCA because Pao teaches methods to improve computational efficiency that are compatible with Radial Base Function (RBF) architecture, and that it would have been obvious to one of ordinary skill in the art, at the time of the invention, to add the teaching of Pao to the admitted prior art.

Pao teaches a system for reduced-dimension mapping of pattern data. Mapping is applied through conventional single-hidden-layer feed-forward neural network with non-linear neurons. The system functions to equalize and orthogonalize lower dimensional output signals by reducing the covariance matrix of the output signals to the form of a diagonal matrix, or constant times the identity matrix. The system allows for visualization of large bodies of complex multidimensional data in a low-dimension approximation to reduce randomness associated with other methods with

similar purposes, and to keep the mapping computationally efficient at the same time.

Pao discusses PCA to point out its limitations, and teach why it is not used in the system taught by Pao. Specifically, at Col. 2, lines 21-23, Pao states that PCA in pattern recognition has a failing insofar as what is retained is not necessarily that which helps interclass discrimination.

Part of the system taught by Pao involves reducing dimensions of input data with a system that employs nonlinear outputs using a nonlinear variance-constraint method, whereas part of Appellants' invention teaches reducing dimensions of input data with a system that involves linear outputs using PCA. Pao teaches at Col. 4, lines 10-11, that linear PCA methods are limited by their linear nature. Moreover, Pao specifically describes the limitations of PCA with respect to dimension reduction at Col 10, lines 49-52. In particular, Pao states that PCA computations of a co-variance matrix are lengthy, and that linear constraints lead to loss of information when dimension reduction is large.

Since the Appellants' invention involves reducing the dimensions of input data using a system and method that employs linear outputs derived from PCA, and Pao teaches reducing the dimension of input data with a system that uses nonlinear outputs using the nonlinear variance-constraint method, it is clear that Pao teaches away from using PCA by discussing the limitations and failings of PCA. It would therefore not be obvious, to one skilled in the art, to combine the teachings of Pao with Appellants' admitted prior art.

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (CAFC 1983), cert. denied, 469 U.S. 851 (1984)

In view of the foregoing, it is respectfully submitted that the admitted prior art and Pao, whether taken alone or in combination, do not teach or suggest the subject matter recited in claims

1, 10, 11, and 12, as each of these references fails at least to teach or suggest systems, methods, and articles of manufacture for classifying inputs to a neural network. Specifically, the references, alone or combined, do not teach or suggest performing Principal Component Analysis (PCA) on a plurality of inputs to the neural network to produce a plurality of PCA outputs and coupling each of the plurality of PCA outputs to a plurality of output nodes. Further, the references do not teach or suggest multiplying each coupled PCA output by a weight selected for the coupled PCA output and calculating a node output for each output node. Moreover, the references, alone or combined, do not teach selecting a maximum output from the plurality of node outputs and associating an output class with the maximum output. In fact, Pao teaches away from combining PCA with Appellants' admitted prior art by discussing, at length, the limitations and failings of PCA with respect to data dimension reduction using linear methods.

In light of the fact that Pao teaches away from combining PCA with Appellants' admitted prior art, it is improper to combine Appellants' admitted prior art with the teachings of Pao. One cannot base obviousness upon what a person skilled in the art could, or might, try but rather must consider what the prior art would have led a person skilled in the art to do. In re Antonie, 559 F.2d 618 195 USPQ 6 (CCPA, 1977). Further, combining Appellants' admitted prior and Pao is improper because each of these references fails to suggest or disclose a motivation for combining the references.

The U.S. Court of Appeals for the Federal Circuit (the "Federal Circuit") has consistently and repeatedly stated the legal test applicable to rejections under 35 U.S.C. § 103(a) Recently (*In re Rouffet*, 47 USPQ2d 1453 (Fed. Cir., July 15, 1998)), the Court stated:

> [V]irtually all [inventions] are combinations of old elements. Therefore an Examiner may often find every element of a claimed invention in the prior art. Furthermore, rejecting patents solely by finding prior art corollaries for the

> claimed elements would permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." To prevent the use of hind sight based on the invention to defeat patentability of the invention, this court requires the Examiner to show a motivation to combine the references that create the case of obviousness. The Board [of Appeals] did not, however, explain what specific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination. Instead, the Board merely invoked the high level of skill in the field of the art. If such a rote indication could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance. Instead, in complex scientific fields, the Board could routinely identify the prior art elements in an application, invoke the lofty level of skill, and rest its case for rejection. To counter this potential weakness in the obviousness construct **the suggestion to combine requirements stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.**
>
> *In re Rouffet*, 47 USPQ2d 1457-58 (Fed. Cir., July 15, 1998) (citations omitted, emphasis added).

More recently, the Federal Circuit again dealt with what is required to show a motivation to combine references under 35 U.S.C. § 103(a). In this case the court reversed the decision of the Board of appeals stating:

> [R]ather then pointing to specific information in Holiday or Shapiro that suggest the combination..., the Board instead described in detail the similarities between the Holiday and Shapiro references and the claimed invention, noting that one reference or the other-in combination with each other... described all of the limitations of the pending claims. Nowhere does the Board particularly identify any suggestion, teaching, or motivation to combine the ... references, nor does the Board make specific-or even inferential-findings concerning the identification of the relevant art, the level of ordinary skill in the art, the nature of the problem to be solved, or any factual findings that might serve to support a proper obviousness analysis.
>
> *In re Dembiczak*, 50 USPQ2d 1614, 1618 (Fed. Cir., April 28, 1999) (citations omitted).

Thus, from both *In re Rouffet* and *In re Dembiczak* it is clear that the Federal Circuit requires a specific identification of a suggestion, motivation, or teaching why one of

ordinary skill in the art would have been motivated to select the references and combine them. This the Examiner has not done.

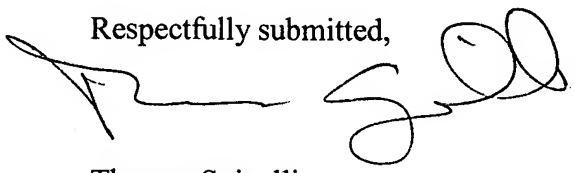
Therefore, those skilled in the art would not be motivated or suggested to combine Appellants' admitted prior art with Pao to solve the objective addressed by the present invention because Pao teaches away from combining PCA with Appellants' admitted prior art. The only test to be applied when considering obviousness is whether there is a motivation or suggestion to combine the references. As discussed above, the Examiner has not made such a showing.

In light of the state of the law as set forth by the Federal Circuit and the Examiner's mischaracterization of the cited references both individually, and with regard to the motivation to combine the cited references, the Appellant respectfully submits that the rejections for obviousness under 35 U.S.C. § 103(a) lack the requisite motivation and must be withdrawn.

2. CLAIMS 3-9

Claims 3-9, which depend directly or indirectly from the independent claim 1, incorporate all of the limitations of independent claim 1 and are therefore patentably distinct over the admitted prior art in view of Pao for at least those reasons provided for claim 1.

Respectfully submitted,



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APPENDIX A

CLAIMS ON APPEAL: CLAIMS 1 and 3-12
Application Serial No. 10/014,199

1. (Rejected) A method for classifying inputs to a neural network, comprising:

performing Principal Component Analysis (PCA) on a plurality of inputs to the neural network to produce a plurality of PCA outputs;

coupling each of the plurality of PCA outputs to a plurality of output nodes;

multiplying each coupled PCA output by a weight selected for the coupled PCA output;

calculating a node output for each output node;

selecting a maximum output from the plurality of node outputs; and

associating an output class with the maximum output.

2. (Cancelled)

3. (Rejected) The method of claim 1, wherein each output node corresponds to a class, and wherein the step of associating an output class with the maximum output further comprises determining which output node produces the maximum output and associating the output class with the class corresponding to the output node that produced the maximum output.

4. (Rejected) The method of claim 1, further comprising the step of calculating the weights.

5. (Rejected) The method of claim 4, wherein all inputs comprise a single vector that corresponds to a pattern, and wherein the step of determining the weights further comprises the steps of:

inputting at least one training vector;

computing, for each of the at least one training vectors, PCA outputs; and

determining the weights by using the PCA outputs associated with the at least one training vector.

6. (Rejected) The method of claim 5, wherein:

each output node corresponds to a class;

the step of inputting at least one training vector further comprises associating an input class with each training vector; and

the step of determining the weights by using the PCA outputs further comprises determining the weights so that an appropriate output node is selected in the step of selecting a maximum output, the weights being chosen so that input class matches the class corresponding to the appropriate output node.

7. (Rejected) The method of claim 1, wherein each PCA output comprises an eigenvector.

8. (Rejected) The method of claim 7, wherein each eigenvector has a dimension that is less than the number of inputs.

9. (Rejected) The method of claim 7, wherein each PCA output further comprises an eigenvalue corresponding to the eigenvector of the PCA output.

10. (Rejected) A classifier for classifying inputs to a neural network, comprising:

a Principal Component Analysis (PCA) device coupled to a plurality of inputs to the neural network, the PCA device adapted to perform PCA on the plurality of inputs and to determine a plurality of PCA outputs;

a plurality of connections coupled to the PCA outputs and coupled to a plurality of output nodes, each connection having assigned to it a weight, and each output node adapted to produce a node output by using the PCA outputs and the weights; and

a device coupled to the node outputs and adapted to determine a maximum node output and to associate the maximum node output with a class.

11. (Rejected) A system for classifying inputs to a neural network, comprising:

a memory that stores computer readable code; and

a processor operatively coupled to said memory, said processor configured to implement said computer readable code to:

perform Principal Component Analysis (PCA) on a plurality of inputs to the neural network to produce a plurality of PCA outputs;

couple each of the plurality of PCA outputs to a plurality of output nodes;

multiply each coupled PCA output by a weight selected for the coupled output;

calculate a node output for each output node;

select a maximum output from the plurality of node outputs; and

associate an output class with the maximum output.

12. (Rejected) An article of manufacture for classifying inputs to a neural network, comprising:

a computer readable medium having computer readable code embodied thereon, said computer readable program code being executable to perform a method comprising:

performing Principal Component Analysis (PCA) on a plurality of inputs to a neural network to produce a plurality of PCA outputs;

coupling each of the plurality of PCA outputs to a plurality of output nodes;

multiplying each coupled PCA output by a weight selected for the coupled output;

calculating a node output for each output node;

selecting a maximum output from the plurality of node outputs; and

associating an output class with the maximum output.

APPENDIX B

EVIDENCE SUBMITTED
Application Serial No. 10/014,199

There is no evidence relied upon by the Appellants in this appeal.

APPENDIX C

RELATED PROCEEDINGS
Application Serial No. 10/014,199

There are no pending appeals or interferences related to this application to Appellants' knowledge.